

No. 14.— *Some New Parasitic Nematodes from Yucatan (Mexico),
Including a New Genus of Strongyle from Cattle*

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THE parasites described in this paper represent part of a collection secured during the months of February, March and April, 1929, when the writer acted as parasitologist to the Yucatan Medical Expedition under the leadership of Dr. George Cheever Shattuck of the Department of Tropical Medicine, Harvard Medical School. The primary purpose of this expedition, which was financed in part by the Carnegie Institution of Washington, was to make a preliminary medical and sanitary survey of the indigenous Maya Indians and other population groups in the rural areas of Yucatan: The Carnegie Archaeological Station at Chichen Itza was used as a laboratory base for these investigations.

In addition to investigating the parasitic fauna of man in this locality (the report on which will be published elsewhere) advantage was taken of the opportunities that incidentally presented themselves for making helminthological examinations of various domestic animals slaughtered for food purposes, as well as of other animals that could be secured.

In this paper, several new nematodes are described. Of these, two possess such unique features as to necessitate the erection of new genera for their taxonomic disposition. In general, parasitization by helminths in this region was found to be low except in a few birds. Only a very few birds were found infested with trematodes, cestodes and acanthocephalans, and as yet the study of these forms has not proceeded to the point where their identity has been established.

STRONGYLOIDEA

STRONGYLIDAE

BOSICOLA gen. nov.

Generic diagnosis.—? Strongylinæ: body robust and cylindrical, attenuated at the extremities. The cephalic cuticle is dilated to form an annular hood around the oral orifice; posterior to this in the cervical region two additional cuticular collars are present. Two stout lateral papillae, or so-called amphids, present; median-dorsal and ventral papillae acicular, projecting slightly beyond the cuticular rim of the

circular mouth opening. Only a single leaf crown composed of small peglike elements. Buccal capsule infundibular and unarmed at its base. Esophagus cylindrical, slightly dilated at its base. Excretory pore at about the level of the anterior third of esophagus. Cervical papillae present. Bursa copulatrix slightly broader than long with a distinctly marked dorsal lobe. Ventral rays equal and parallel. Externo-lateral arises from a common trunk with the medio- and postero-lateral rays. Dorsal ray cleft; spicules long, slender and equal. Female tail tapers gradually to an acute point. Vulva near the anus. Oviparous.

Type species.— *Bosicola tricollaris*, spec. nov.

BOSICOLA TRICOLLARIS spec. nov.

Specific diagnosis.— *Bosicola*: cuticle white, with very fine transverse striations and also with inconspicuous longitudinal linear markings. The two stout lateral papillae are easily seen projecting as acicular filaments beyond the oral margin; two less conspicuous but broader papillae occur in the median-dorsal and median-ventral positions at the edge of the oral opening. The single corona radiata consisting of between 32 and 36 minute peglike elements lining the edge of the buccal aperture. Mouth circular in outline, and directed straight forwards. Buccal capsule, with cuticularized walls of medium thickness, funnel or cone shaped, and devoid of teeth or homologous cuticularized armature. It measures 40 μ in diameter at its outer edge and is about 55 μ in length. There are three distinct inflations of the cuticle in the cephalic region: the first, about 140 μ broad and 40 μ long, forms a hood or cap around the oral aperture; the second, about 120 μ broad and 160 μ long, whose anterior margin is inserted under the posterior margin of the second, and which is slightly smaller than the second, forms, together with the third cuticular inflation, two collars surrounding the cervical region.

The excretory tube opens ventrally by a conspicuous pore just under the posterior collar. A narrow annular band of nerve fibres, about 0.2 mm. from the anterior extremity, sends innervations to the small and slender cervical papillae, which may be discerned in favorable specimens in the lateral lines near the posterior border of the third cuticular inflation. The esophagus is a wide tube with a narrow lumen lined with cuticle. It measures about one-twentieth of the total length of the body in both sexes and is only slightly dilated in its posterior quarter. The intestine is rectilinear and a short narrow rectal region is differentiated posteriorly.

Male.—Length about 12.4 mm.; greatest breadth 0.37 mm. The spicules are striated transversely, slender, and each about 0.67 mm. in length. They have a slight expansion of the head, and they are in apposition for the posterior two thirds of their length. Gubernaculum absent. Genital cone more or less quadrate in shape. The bursa, about 0.4 mm. broad by 0.25 mm. long, is composed of two large lateral lobes united dorsally by a smaller median lobe. The externo-dorsal ray arises near the middle of the dorsal ray which subsequently bifurcates to form two pairs of digitiform processes, one short and thin, and the other larger and extending to the margin of the bursa. Lateral rays about equal in width and parallel. Externo-lateral ray more distinctly separated than postero- and median-lateral rays. Ventral rays parallel, and take their origin near the base of the trunk. Pre-bursal rays not observed.

Female.—Length about 14.2 mm.; greatest width 0.4 mm. Posterior extremity gradually attenuated behind the vulva to an acute point. The rectal portion of the intestine, 0.12 mm. long, opens at the anus situated in a slight depression of the general contour, 0.36 mm. from the caudal extremity. The vulva has salient lips and is situated about 0.25 mm. anterior of the anus. Vagina about 0.14 mm. in length. In specimens in which eggs are not present in the terminal portion of the genital passage, the vagina lies almost at right angles to the axis of the body. It opens into two muscular pyriform ovejectors, in continuity with which are two forward-running uteri. The eggs are thin-shelled and elliptical in outline. They measure 74 to 82 μ by 40 μ and are discharged from the body in the early stages of segmentation.

Host.—*Bos taurus*.

Location.—Small intestine, especially ileum.

Locality.—Yucatan, Mexico.

Type specimen (σ) in glycerin, Cat. no. 41N, Helminthological Collection, Museum of Comparative Zoölogy. Paratypes of both sexes catalogued under same number. Paratypes also in U. S. Nat. Mus., Helminthological Collection, No. 8080.

Numerous specimens of the above-described parasite were found in one of three steers examined. Its pathogenic significance is not known, but since the parasites were found either only lightly attached to the walls of the intestine or free in the mucous contents of the bowel in which lesions were not apparent, it is probably of little pathological importance.

The parasite is very distinctly different from any member of the Strongylidae previously described. Since the helminths of domesti-

cated animals are now fairly well known for most regions of the world, it may well be that the form with which we are here dealing is of local occurrence, and is one which has become adapted to cattle, its original host being represented in the autochthonous fauna of the country, possibly the native deer.

Despite the extensive knowledge which has now accumulated on the structure of the multiplicity of forms incorporated in the important family, the Strongylidae, it not infrequently happens that difficulties are experienced in the allocation of the new genera that are described in the scheme of classification originally suggested by Railliet and Henry, and now so generally adopted. When the plan adopted for the systematic arrangement of allied forms falls short, it must necessarily also fail in the supplementary purpose of classification — to express genetic relationships. The artificiality of the present classification of the Strongylidae is gradually becoming evident, and a revision of the taxonomy of the group based on other considerations than those now in use or the emendation of definitions of groups as at present recognized seems to be called for. It is desirable, however, to postpone such an undertaking, until a still larger number of forms that do not easily fit themselves into the present system of classification have been described.

The parasite described in this paper, and for which the name *Bosicola tricollaris* is proposed, is a typical member of the Strongylidae whose subfamily affinities are obscure, for it cannot be accommodated in any of the four constituent subfamily groups, as these are at present delimited. On the basis of the important structures of the buccal capsule and cephalic region and in the disposition of the taxonomically significant characters in the reproductive organs in both sexes, it presents affinities with the members of the Oesophagostominae Railliet, 1915. It differs, however, from members grouped in this subfamily in that an external corona radiata is absent and in that, instead of having a single cuticular inflation limited ventrally by a cervical groove, the process of cuticular vesical formation in the cephalic region has proceeded to the point of development of three separate inflations or collars. On the basis of the structure of the buccal capsule, *Bosicola* shows greatest resemblance to those members of the Strongylinae which do not possess chitinous teeth or similar armature, but differs even in this connection from any genus of the Strongylinae as yet described.

METASTRONGYLIDAE**CHEIROPTERONEMA gen. nov.**

Generic diagnosis.—Strongyloidea: long filiform nematodes with finely striated cuticle. Buccal cavity very shallow and without an obvious cuticularized capsule. Esophagus without posterior swelling. Bursa copulatrix narrow, consisting of two lateral lobes and supported by well-developed rays of reduced number. Female unknown. **Parasites of the alimentary tract.**

Type species.—*C. globocephala* spec. nov.

CHEIROPTERONEMA GLOBOCEPHALA spec. nov.

Specific diagnosis.—*Cheiropteronema*: male 19.4 mm. long and 0.4 mm. broad near the middle. Body filiform, tapering towards both extremities. The anterior end is bluntly rounded and carries a hemispherical dome of cuticle. Near its apex, two lateral papillae appear slightly elevated above the cuticular surface. The oral aperture, as far as can be seen from a lateral view, is not guarded by salient lips (fig. 6). There is a very fine transverse striation of the cuticle and in addition it is marked by numerous fine longitudinal lines producing a checkered effect. Cervical papillae were not found. Buccal cavity either much reduced or absent, the mouth seeming to give entrance directly into the esophagus. The esophagus is straight and of practically uniform diameter. Its length is 0.42 mm. A delicate tube which probably represents the terminal portion of the excretory system opens on the ventral surface of the body, 60 μ behind the end of the esophagus.

Male.—Body abruptly truncated posteriorly to end in an acutely pointed tail (fig. 7). Two lateral lobes of cuticle arise from the sides of the body to form a caudal bursa which is open on the dorsal surface. These lobes are supported by six short stumpy rays as figured. Dorsal ray undivided and slender. Postero-lateral ray widely separated from median- and externo-laterals which are joined. Ventro-ventral and latero-ventral rays equal and parallel. There is a prominent genital cone projecting into the bursa. Spicules equal; 0.36 mm. long with slight swellings near their middle where the spicules measure 11 μ in width. A slender accessory piece or gubernaculum, 35 μ long, is present.

Female.—Unknown.

Host.—*Artibeus jamaicensis*.

Location.—Large intestine.

Locality.—Yucatan.

Type specimen.—Cat. no. 47 N, Helminthological Collection, Museum of Comparative Zoölogy, Cambridge, Mass.

The parasite described above is represented by a single male specimen found in the large intestine of the common neotropical “leaf-nosed” bat at Chichen Itza. Systematically, the reduced character of the bursa copulatrix and the atypical supporting rays thereof bespeak the affinities of Cheiropteronea with the Metastrongylidae. The fact that previously reported metastrongyles are recorded exclusively from the lungs and vascular systems, whereas the present material was taken very definitely from the intestine, need not be considered in making a taxonomic disposition of the organism on a purely morphological basis, although the several unique structures, such as the cephalic dome, may perhaps warrant its allocation in a new subfamily of the Metastrongylidae when, with more material available, the female is studied.

SPIRURIDAE

SPIRURINAE

CYRNEA Seurat, 1914

CYRNEA PIAYAE spec. nov.

Specific characters.—*Cyrnea*: length of male 8.5 mm., greatest breadth 0.35 mm. Length of female 16.4 mm., greatest breadth 0.56 mm. Cuticle finely striated transversely and in addition is marked throughout its length by secondary rugae. Head with four well-defined lips bearing four conspicuous papillae. Buccal cavity cylindrical, 57 μ long and 16 μ in diameter. Esophagus about one third of body length—2.88 mm. in a male specimen. Nerve ring encircles esophagus in its anterior part, 0.22 mm. behind the mouth. Cervical papillae very inconspicuous, on level with nerve ring.

Female.—Tail obtusely rounded. Anus 0.16 mm. from caudal extremity. Vulva only slightly salient, 1.92 mm. from posterior end. Vestibule or vagina 0.24 mm. long, at right angles to the long axis of the body. Uteri parallel and spacious. Egg elliptical, with relatively thin shell, 36 μ by 21.6 μ in size.

Male.—Posterior end straight. Caudal alae spread out, and marked with a mosaic design. There are nine pairs of caudal papillae having a distribution as shown in figure 8. Three preanal pairs are large and have short peduncles; postanally there are an additional three pairs of large papillae adorning the caudal wings and three pairs of smaller

sessile papillae arranged in linear series along the internal border of the wings. The spicules are unequal, measuring respectively 0.58 mm. and 1.22 mm. A gubernaculum, not well chitinized and of small dimensions, is also present.

Host.— *Piaya cayana thermophila*.

Location.— Duodenum.

Locality.— Chichen Itza, Yucatan.

Type material.— Cat. no. 38 N, Helminthological Collection, Museum of Comparative Zoölogy, Cambridge, Mass.

The parasite described above, of which only a single pair representing the male and female were available for study, is relegated to a new species of the genus *Cyrnea*. The name *C. piayae*, which carries reference to the host, is proposed. It may readily be distinguished from the six species, which, according to the recent valuable monograph of Cram (U. S. nat. mus., 1927, bull. 140, p. 167), have been described in this genus, on the basis of the character of the caudal papillae, and also by the fact that its eggs are substantially smaller than those of other species.

HADJELIA Seurat, 1916

HADJELIA CORAGYPIS spec. nov.

Specific characters.— *Hadjelia*: length of male 6.15 mm., greatest breadth 0.26 mm. Length of female from 13.5 to 16.2 mm., greatest breadth (in region of vulva) 0.4 mm. The body tapers gradually at both extremities. Cuticle finely striated transversely. Head distinctly set off from the rest of the body by an annular constriction of the cuticle. Mouth typically limited by two lateral trilobed lips. Cylindrical buccal capsule 65 to 73 μ long and 18 μ wide. Esophagus, which is divided into glandular and muscular portions, is 2.72 mm. long in a female specimen of 15 mm. length. Cervical papillae very minute and situated at the level of the nerve commissure, 0.5 mm. from the anterior extremity. The excretory system, as seen in the living worms, comprises a bulbous vesical opening by a short tube about 70 μ behind the nerve ring.

Female.— Fairly straight. Anus situated 90 μ from the obtusely rounded posterior extremity. The vulva is situated slightly posterior to the middle of the body, 8.2 mm. from the anterior end. Uteri prominent and contain countless, relatively thick-shelled, elliptical eggs, 36–39 μ by 21–23 μ in size and embryonated when discharged. Anus 120 μ from posterior extremity of body.

Male.— On preserving in formalin or hot alcohol, the tail of the male assumes a tight spiral coil that makes taxonomic study difficult but which may be avoided if the specimens be permitted to die slowly in tap water before fixing. The caudal extremity is illustrated in figure 9. The caudal alae are narrow; that of the left side is shorter than its fellow of the right. The six pairs of alar papillae, of which four pairs are pre-anal and two pairs post-anal, are small and have such short pedicels that they at first appear to be sessile. A small median papilla is to be seen on the anterior rim of the cloaca and a second small papilla may be noted mesially near the extremity of the tail. The ventral surface of the body in the caudal region is ornamented with slightly raised cuticular ridges running longitudinally. The cloacal aperture is situated about 250 μ from the extremity of the tail. Spicules unequal, the left measuring 1.23 mm. by 12 μ broad, and the right about 0.45 mm. and 14 μ broad.

Host.— *Coragyps urubu*.

Location.— Under lining of the gizzard.

Locality.— Chichen Itza, Yucatan.

Type material.— Cat. no. 40 N, Helminthological Collection, Museum of Comparative Zoölogy, Cambridge, Mass.

The parasite described above corresponds in the most significant characteristics with the genus *Hadjelia* Seurat, 1916, of which all the four species previously recorded have come from the eastern hemisphere. On the morphological side the parasite may be readily distinguished from previously described species by the fact that in the female the vulva is situated near the middle of the body and not, as in others, anterior to the end of the esophagus. The diagnostic characters of the genus should consequently be emended to embrace this difference in the position of the vulva. Other differential characters of this species, for which we propose the name *Hadjelia coragypis*, lie in the size of the spicules and the dimensions of the eggs.

The parasite occurred in all five specimens of the common black buzzard, *Coragyps* (= *Catharista*) *urubu*, examined at Chichen Itza. They live in the submucous coats of the gizzard where, by their tunneling activities, extensive bacterial infection followed by tissue necrosis and sloughing of the mucosa occurs. As many as sixteen of these large worms were extracted from the gizzard of one bird but no acute inflammatory reaction appeared to be occasioned by their presence, an example of remarkable protective adaptation on the part of the host to the activities of what would seem to be a very insidious parasite that actually subsists on blood extracted from the blood vessels.

It is also of interest to note that the adult sex ratio of the species is markedly unequal, only three males as compared with forty females being found after a meticulous search of the entire lining of the gizzards in five birds.

OXYUROIDEA

OXYURIDAE

SYPHACIINAE

ALÆURIS Thapar 1925

ALÆURIS HIRSUTUS spec. nov.

Specific diagnosis.—Fairly robust worms, with a thin white transparent cuticle marked with fine transverse striations about 5μ apart. The entire surface of the body is covered with wavy filaments. These do not appear to be normal outgrowths of the cuticle; they are more likely the attached hyphae of a fungus from which none of the very numerous specimens taken are free. (Compare Thapar's description of *Veveria tuberculata*, Jour. helminthology, 1925, 3, p. 115.) Cervical or lateral cuticular alae absent. Mouth surrounded by three deeply lobed lips, each bearing two small papillae set closely together on its inner anterior face. Buccal cavity shallow, followed by an abbreviated pharyngeal region armed with a minute cuticularized spine. The esophagus is relatively narrow and long, being 56μ wide and a third of the total length of the body in a male 6.0 mm. long, and slightly more than a quarter of the body length in a female 8.7 mm. long. Posteriorly it is enlarged into a fusiform bulb 145μ wide, containing a hinged valvular apparatus. The junction of the esophageal bulb and the region of the chyle intestine is guarded by a second controlling valve. The position of the excretory pore and nerve ring cannot be determined in the preserved material.

Female.—Length from 8.0 to 9.3 mm.; maximum width about 0.65 mm. Body tapers gradually to form a conical tail about 0.25 mm. long. Vulva non-salient; situated just behind the middle of the body. Oviparous. Eggs measure 135μ by 72μ . They are asymmetrically flattened on one side and have fairly thick shells.

Male.—Length from 6.0 to 6.4 mm.; width 0.56 mm. at the widest point. Posteriorly the body is abruptly truncated and is provided with wide caudal alae laterally. The tail terminates as a bluntly rounded appendage, bearing a pair of short pedunculated papillae terminally (fig. 10, p. 4). The cloaca is situated between two paired eminences of

the body. The ventral anterior pair bear each a pair of papillae. A third pair of papillae are borne on the post-cloacal eminence. Whether these eminences are analogous with papilla-bearing peduncles would be a matter of individual interpretation. They are, however, substantially larger than the peduncles of papillae usually encountered among oxyuroids. There is a single spicule, long and acicular. At its proximal end the head is dilated to form a knob; distally the spicule is sharply pointed. In different specimens the length of the spicule varies between 1.22 and 1.45 mm. In individuals not too well cleared in glycerin the thickening of the ventral wall of the cloaca (gubernaculum) is clearly to be seen. It measures 40 μ in length. In the fully cleared male individual the gubernaculum cannot be differentiated from contiguous structures.

Host.—*Iguana rhinolopha*.

Location.—Large intestine.

Locality.—Yucatan.

Type material.—Cat. no. 63 N, Helminthological Collection, Museum of Comparative Zoölogy, Cambridge, Mass.

The characteristics of the worm described here are in full accord with the definition of Thapar's genus *Akæurus*, except that lateral alae do not appear to be present and differences exist in the character and disposition of the caudal papillae in the male. Since the study of these structures is by no means a simple task in the complex of structures surrounding the cloacal region, the differences cannot be stressed to the point of being considered as holding generic value, but with good comparative material available of the related genera *Thelandros* and *Tachygonetria* further examinations for other significant differences between these genera might well be undertaken to substantiate their standing as different genera. Thapar has described two species of *Akæurus*, one from *Testudo ibera* and the other from *Iguana tuberculata*. Our specimens from *Iguana rhinolopha*, for which the name *A. hirsutus* is proposed, may readily be distinguished from both of these on the basis of their larger size, the much longer spicule, the fact that in the male the tail does not extend beyond the border of the caudal alae, as well as on the other considerations mentioned above.